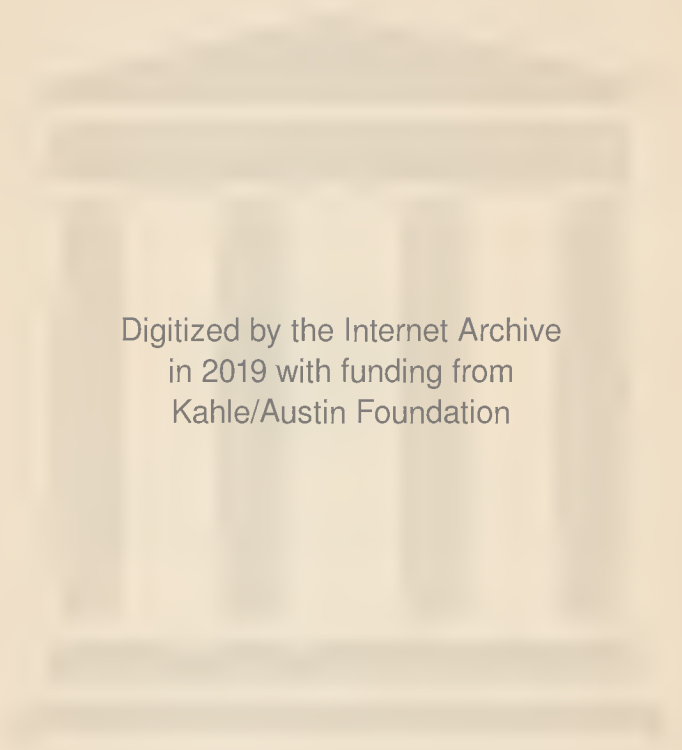
GALLIO

OR

THE TYRANNY OF SCIENCE

J. W. N. SULLIVAN



GALLIO
OR
THE TYRANNY OF SCIENCE

TO-DAY AND TO-MORROW

For a full list of this Series see the end of this Book

GALLIO

OR

The Tyranny of Science

BY

J. W. N. SULLIVAN

LONDON
KEGAN PAUL, TRENCH, TRUBNER & CO., LTD.
NEW YORK: E. P. DUTTON & CO.

Made and Printed in Great Britain by
M. F. Robinson & Co., Ltd., at The Library Press Lowestoft

GALLIO

OR

THE TYRANNY OF SCIENCE

I

There can be no doubt that the prestige of science has greatly increased of recent times. In the days when Dickens wrote *The Mudfog Papers* the man of science, to the general reading public, was a purely comic figure. After the man of science had knocked the bottom out of the Victorian universe with his theory of Natural Selection he inspired the respect we accord to whatever is both powerful and sinister.

He was observed, warily and acutely, as an enemy. This reaction was perfectly justified, for science, as expounded to the populace by such men as Huxley and Tyndall, deprived life of all that had hitherto made it worth living. The gravamen of their offence was not that they made man an integral part of the animal kingdom, but that they presented him with a universe that was entirely purposeless. Such a doctrine would probably come as a shock even to a disillusioned and emaciated Eastern Sage, but to the men of the Victorian age, almost every one of them brought up in an orthodox Christian household and filled with

that belief in a wise Providence that comes of great material prosperity, it was nothing short of an outrage. Even the men of science themselves found their great discovery more than a little disconcerting. Nobody who reads them can fail to detect something strained, something occasionally almost frenzied, in their insistence on the duty of intellectual honesty. These men are, half the time, shouting aloud in order to hearten themselves. They were quite consciously martyrs to the truth. This is true, at any rate, of such men as Huxley and Clifford. There were many men of science, of course, who were not sufficiently alive to live in a

universe of any description. Outside their laboratories they had no perceptible existence. Many of them died simple Christians. But to all interested in such matters it became evident that the goal of science was the detailed explanation of man as the accidental outcome of "matter and motion". Since the arguments of the man of science could not be met (for only science can cast out science) the only thing left was to abuse him. This was magnificently done by Nietzsche, and rather less magnificently by Dostoevsky and Tolstoi. Nietzsche pointed out that the man of science was not a human being. He was merely an instrument,

the most costly, the most exquisite, the most easily tarnished of instruments. He was incapable of love ; he was incapable of hate. His one purpose was to " reflect " such things as he was tuned to receive. The philosophy evolved by such a creature would be expressive of nothing but his own limitations. He would be incapable of understanding the problems that concerned a man. This was also the line taken, more or less, by Dostoevsky and Tolstoi, and it became very popular with artists of all kinds. Wordsworth's scorn for the botanist became the general attitude towards all men of science. It must be admitted

that, judging from biographies of scientific men, there is much to be said for this view. Their favourite authors appear to be Shakespeare and Ella Wheeler Wilcox: they are kind fathers and faithful husbands; in their social relations they are simple-minded snobs; and they are really amused by "lecture-room humour". It seems unlikely that such people know much of the fierce vitality that sent Saints to rot on pillars and in dungeons, that sent martyrs to the stake, or even that weaker form of vitality that causes our Divorce Court judges to be over-worked. That they can understand the universe, when it is obvious they

do not understand Clapham, does not seem likely. That, briefly, was the case of the artist against the man of science. The artist was conscious of more things in heaven and earth, staring him in the face, than he believed the man of science had ever dreamt of in his philosophy.

It is evident that the position to-day is rather different. It has become different since the War. It is probable, as we shall see later, that the War itself is partly responsible for the increased attention paid by the artist to science. But the influence was not direct. The artist was not transported with admiration for the men who could make

poison-gas,[1] although he may have been more inclined to believe their philosophy that existence is meaningless. No, the change was, I believe, due to Einstein: in this respect he must be likened to Newton and Darwin. The fact that his theory is completely unintelligible to the enormous majority of those who take an interest in it is not at all to its disadvantage. Rather the contrary. The artist is attracted by the theory, and respectful to it, not in the least because he understands it, but because he feels it is the result of a most unusual and most

[1] He ought to have been. See *Callinicus*, by J. B. S. Haldane.

powerful *imaginative* effort. It gives him a new conception of the power of the human consciousness. This theory, he is convinced, has come from the heights. It is probable, as a matter of fact, he thinks this because he believes the theory to be about that mathematical platitude, a fourth dimension. The fourth dimension is a phrase to which imaginative people respond with quite extraordinary intensity. Its popularity is like that of giant telescopes, as was proved when a thousand pounds was recently offered for a simple explanation of it. It seems to be the phrase which, to the non-mathematician, is most pregnant

with the vast and liberating unknown. If its meaning is ever generally understood, we may anticipate that interest in Einstein's theory will decline. This will be a pity, because the popular reaction to Einstein's theory is perfectly justified. It *is* the most profound and original scientific theory that has ever been invented, and it displays a kind of imagination almost[1] unprecedented in the history of science. The feeling of the artist about it is right—it is vastly important to him.

Being convinced that the mathematician, at any rate, might be a poet,

[1] I say "almost" because there was Bernhard Riemann and his disciple W. K. Clifford.

the respect of imaginative people for science in general has greatly increased. Many of them have decided that science is worth looking into. Unfortunately mathematical physics, the master science of the present day and the one which has furnished ideals for the other sciences, is hopelessly technical. It is agreed that a modern intelligent man, conscious of his responsibilities as an inhabitant of the twentieth century, should be familiar with " the scientific outlook ". But to acquire this outlook by brooding over the teachings and implications of modern physics is not easy. Thus although it is the recent astonishing

development in physics which is responsible for the renewed public interest in science, it is other sciences that reap the benefit. We have poets and painters who study anthropology, and literary critics who read books on the nervous system. The result appears to have been disastrous. At a time when the physicists are abandoning materialism the artists are accepting it. They are accepting, as the last word of science, a picture of the world that belongs to the early bad manner of physics. Again we hear, but this time from our literary men, that slightly hysterical insistence on the duty of intellectual honesty. It must be

admitted that they have been predisposed to accept this view by the War. It is a curious but indisputable psychological fact, perhaps first noted by Tolstoi, that the sight of a large number of naked human bodies makes it difficult to believe that they are animated by immortal spirits possessing an eternal destiny. The sight of the "wastage" that occurred during the War, for those who saw any of it, produced the same curious effect. Also, a psychological fact that cannot be denied, it was difficult to preserve belief in the essential nobility of man when listening to patriotic non-combatants. There can be no doubt that

the War, for a large number of those connected with it, has made the acceptance of materialism easier. Even the creative artists, at one time great champions of the spiritual nature of man, are now sufficiently dubious about his nature to be reduced to impotence.

2

The notion that we live in a purposeless universe is so opposed to the mental habits we have inherited that it is a matter of the greatest difficulty to bear it constantly in mind. Most of the

people who hold this belief to-day would not do so but for three reasons: the disillusionment caused by the War, their respect for science, and their belief that science preaches materialism. As for the War, that is an experience to which we must accommodate ourselves as best we may. It is consistent with the belief that man is a developing spirit, but it is certainly a proof that he is not very far developed. The respect for science is, I believe, on the whole rather overdone. The respect is a little excessive even when it relates to mathematical physics, but it becomes almost absurd when it relates to some other branches of science.

I believe, for instance, that Freud's form of psycho-analysis, some forms of behaviourism, and many of the statements of the eugenists really are as silly as they look. All that they have in common with such first-class mental activities as physics and chemistry is the name "science." It is this name that secures for them such attention as they get from intelligent people who are not cranks. But even physics is a more provisional and more human thing than some romantic references to it would lead one to suppose. Even the tower of the mathematician, which Mr Bernard Shaw imagines to have been always

unshaken, has been seriously disturbed on more than one occasion. The student of the history of science will not be too confident even of the "indubitable certainties" of physics when he reflects on the universal passion of belief that attached to the notion of a mechanical ether, for whose present absence from the universe some men of science are still inconsolable, and when he reflects on the fate that has overtaken that "most perfect and perfectly established law", Newton's law of gravitation. There are no indubitable certainties in science, a fact that we who are contemporary with the destruction of the Newtonian

system are not likely to forget. There are only provisional hypotheses. It may even be, as Mr J. B. S. Haldane prophesies, that physiology will one day invade and destroy mathematical physics, by which somewhat dark saying I suppose him to mean that the attempt to describe phenomena mathematically may be given up. Whether he means that or not, it is a possibility, as Professor Eddington has hinted. The scientific practitioner usually treats his hypotheses as tools, but to the layman they become dogmas. One is led to believe this by seeing that many of those who accept materialism on what they suppose to be scientific evidence

are rendered acutely unhappy by their belief. A truer knowledge of the status of scientific theories would render this agony unnecessary. There are people with a natural leaning towards materialism, and science, preferably somewhat old-fashioned science, will give them quite sufficient grounds to indulge their propensity with complete intellectual honesty. But science does not, and never has, brought forward sufficient evidence to justify a man turning materialist against his will. And perhaps no man has ever done so. Perhaps one can take the agonies of modern poets too seriously. Many artists, not only small ones, have no

real indwelling force such as a man like Beethoven obviously possessed. They are merely very impressionable and *adopt* an attitude towards life, and this attitude is accepted and maintained, not because they really think it is true, but because they derive strength from it. It gives them a centre from which they can work; it gives them a feeling of strength and completeness. The maintenance of their attitude towards life may become the condition that they exist and function as artists at all. Nevertheless, the attitude is maintained only by a constant effort of will, although, since the motive is self-preservation, the

artist will nearly always think himself perfectly sincere. But I shall, without going into these refinements, take the unhappiness of our modern literary men at its face-value, those, that is, who believe that the universe is purposeless and think this belief is founded on scientific evidence.

The point of view has been well put recently by Mr I. A. Richards,[1] a literary critic who thinks it possible that poetry may be destroyed by science. He speaks of the "neutralization of nature" which has been effected by science, and contrasts this with the "magical view" of the world that has

[1] *Science and Poetry*. 1926

hitherto been accepted by artists. What he means by this is that science reveals to us a universe quite indifferent to all human aspirations, whereas artists have hitherto assumed that man is of cosmic significance. The poet must learn to accept the scientific universe and give up believing in things like "inspiration", "a reality deeper than the reality of science", and so on. "Experience", says Mr Richards, "is its own justification", by which he appears to mean that experience just happens to be what it is by some kind of accident. It points to nothing beyond itself. The ground for this belief is not, in Mr. Richards' case,

old-fashioned materialism. "It is not what the universe is made of but how it works, the law it follows, which makes knowledge of it incapable of spurring on our emotional responses." This reminds one of the "iron laws" of the Victorian age, which many people found so depressing, although the logical connection between existence having conditions and existence being purposeless is a little hard to follow. But although the particular iron laws of the Victorians have gone, Mr. Richards finds the theory of relativity no more cheering. "A god voluntarily or involuntarily subject to Einstein's General Theory of Relativity does not

make an emotional appeal and physics does not find it necessary to mention him." Apparently it is the existence of any law at all that is resented: the poet can feel happy only in a world of pure miracle. I strongly doubt the correctness of Mr Richards' diagnosis.[1] I am certain that not all poets have been as childish as that. No—the essential element in this general outlook is not that phenomena occur in an orderly way, but that man's existence is not regarded as forming part of some universal purpose. The essential element is the same as in old-fashioned

[1] But possibly Mr Richards means that the scientific description does not include values. See Section 5 of this essay.

materialism, the "accidental collocations of atoms" theory. The emphasis was on the "accidental" not on the "atoms". This becomes clear when Mr Richards describes the appropriate emotional reaction to his view. "A sense of desolation and uncertainty, of futility, of the baselessness of aspirations, of the vanity of endeavour, and a thirst for a life giving water which seems suddenly to have failed, are the signs in consciousness of this necessary reorganization of our lives." It is difficult to believe that this state of mind can be produced by the recognition of such facts as that unsupported stones always fall to the

ground. But if Mr Richards is right, I suggest that the poets who are so depressed by law and order should study, besides the theory of relativity, Quantum Theory. They will find there much that is, at present, agreeably miraculous. But one need not fly to miracles to get rid of the bug-bear of "unalterable law". It is only necessary to understand the true status of the unalterable laws, and this is just what relativity theory enables us to do.

3

The idea that there is a conflict

between science and art, which is at bottom the idea that there is a conflict between science and mysticism, rests, I have suggested, upon an old-fashioned conception of the status of physics. The first duty of a man who bases his conclusions on science is to make sure that his science is up-to-date. The science that leads to the depressing conclusions I have just sketched is not up-to-date. Until a few years ago the physicist thought that the material universe he dealt with was a real, objectively existing universe in the sense that, in the absence of consciousness, it would be very much the same as it appeared to be. This

universe was subject to laws, and these laws might conceivably have been different. There was no *a priori* reason, for instance, why the force of gravitation should not vary as the inverse cube of the distance. There was no *a priori* reason why matter and energy should be conserved. These were laws of governance of the material universe; their discovery had required much effort and the rejection of alternatives. Man was in no sense responsible for them: he happened to live in a universe governed by them. These were the iron laws of the Victorians and are the laws, apparently, that depress modern poets. One of the great

discoveries of relativity theory is that these laws need be no more depressing than the laws of Euclidean geometry. No artist has felt his aspirations baseless because he cannot draw a circle whose circumference is six times its radius. He has no more right to despair because there is an inexorable law of gravitation. This has been made clear by Professor Eddington, whose mathematical development of relativity theory is of great philosophical importance, and would, in a more adequately educated community, be given more newspaper headlines than Tutankhamen. The real universe, according to relativity theory, is a

four-dimensional world of point-events. Of the nature of point-events we know nothing. All that we require to know, for the purposes of physics, is that it takes four numbers to specify a point-event uniquely, and that some kind of structure—a minimum amount of structure—may be postulated of the world of point-events. We then find, purely by mathematical processes, that certain characteristics of this world will have the quality of permanence. The mind, faced with this world of evanescent point-events, selects those characteristics that are permanent as being of special interest. This is merely because the mind

happens to be that kind of thing. As a consequence of this predilection of the mind there arises space and time, matter, and the laws of nature. There arises, in fact, the "objective universe". The real world of point-events has many other characteristics to which the mind pays no attention. A different principle of selection, exercised on the same total world of point-events, would result in an utterly different universe, a universe that is, for us, quite unimaginable. And the universe that the mind has selected and constructed from the world of point-events does not in the least depend on what the point-events *are*. All that is necessary

is that a certain minimum amount of structure should be attributed to the world of point-events. It is from the relations between the point-events, quite independent of their substance, that the mind has created the material universe and its laws. These laws, it must be emphasized, are *necessary* consequences of the mind's selective action. They are necessary in the same sense that the sum of the three interior angles of a Euclidean triangle must be two right angles. Of the underlying reality deduced by physics we can say almost nothing. It may be what Newton called the "sensorium" of God, and the point-events may be his

thoughts. They do not succeed one another in time for, at this stage of analysis, space and time are "merged in one". This perfectly gratuitous hypothesis may appeal to some mystics, for our thoughts, considered as belonging to the world of point-events, would be part of the thoughts of God. It would be indeed true that in him we lived and moved and had our being. We see, then, the limitations of physics. All that depends on the *structure* of reality belongs to physics, including other universes than ours. All that depends upon the *substance* of reality for ever lies outside physics. As to the actual universe we live in, why we

should regard it as actual is a problem for psychology. The difference between the actual and the non-actual is a distinction conferred by our minds. It is very probable that the whole movement of the universe in time is also contributed by our minds. It seems to be true that events do not take place—we come across them. Why we do not know the future is again a question for psychology. Ignorance of the future, like the existence of the material universe, is a clue to the constitution of our minds. This has a bearing on the question of "purpose" in the universe. The conception of purpose seems to suppose a

process in time, and therefore may be a totally irrelevant idea when applied to reality.

The philosophical implications of relativity theory will doubtless take a long time to work out. The four-dimensional universe of point-events is something that can be argued about but it is, to use an old-fashioned phrase, "inconceivable". Mankind, excepting professional logicians, never remains content with the inconceivable. A purely logical conclusion is not enough; it has to be grasped imaginatively, by which I do not necessarily mean that it has to be pictured. To become familiar with a

theory does not merely mean that one is able, as a form of mental wire-walking, to slip nimbly back and forth over the logical connections of the structure. It means taking it into oneself in some indefinable manner —becoming " intimate " with it. Only when a theory is " realized ", as we say, do we feel that we truly understand it. Ideas, points of view, that we were able to see only in flashes, become part of our normal intellectual equipment. The process may well be called a growth of consciousness. There are ideas which our consciousness, when it first approaches them is, as it were, too flabby to grasp. We

first have to exercise our mental muscles. Every student of a line of thought such as mathematics, which is rather outside our normal preoccupations, becomes aware of an actual change in his mental powers. Notions so abstract that at first they seemed almost meaningless gradually become perfectly clear and permanent additions to one's mental resources. Students of musical composition find that their capacity for mentally hearing a number of parts rapidly increases. In some cases it is almost as if a new faculty of the mind were born and developed.

The physics of recent years has

made heavy demands upon our capacity for realization. The electron theory, with its analysis of matter into "disembodied charges of electricity" required, for its understanding, the breaking up of old habits of thought. To young students the idea was, at first, extremely baffling—almost nonsense. To realize it one had to make more abstract one's idea of matter until the notion of "substance" was replaced by the notion of "behaviour". Anything that behaved in the way characteristic of matter was matter. The central idea of the restricted principle of relativity, the idea of different time-systems, was still more

difficult to grasp. In this case we had to become convinced that our ordinary idea of simultaneity, an idea which seemed perfectly clear, was really a bogus idea. The attacks on the theory of relativity show, for the most part, merely that their authors are unable to abandon old habits of thought. With the complete theory of relativity, as we have it now, the task of adjustment has become enormous. There cannot be, even now, more than very few scientific men who naturally approach a problem from the point of view of relativity theory. In most cases a conscious effort of mental preparation is required, such

as occurs when a novelist, sitting down to continue his work, deliberately thinks himself into the appropriate frame of mind. Yet doubtless the next generation or so will think in terms of relativity theory as naturally as we thought in terms of the Newtonian system. I would not hold it as impossible that the human mind may come to realize, imaginatively as well as logically, the four-dimensional space-time continuum. But it seems that the mind of the physicist, at any rate, will have to do more than become familiar with relativity theory. It will have to accommodate itself somehow to the quantum theory for, although

we can write down the laws which govern sub-atomic phenomena and make deductions from them, these laws are, at present, unintelligible. An electron behaves as if it had foreknowledge of what it was about to do and could make the mathematical calculations necessary to achieve its end. We cannot admit this to be possible, and we can only suppose that the difficulty arises from the way we think about things. We must learn to think in a different way, and what the consequences of that new way of thinking will be no one can say. We know very little of the possibilities of the development of the human consciousness.

The proper attitude to-day in which the problem of man's place in nature should be approached is one of bewilderment and humility. Both the material universe and the mind of man are very mysterious things. At the present time it is only an inadequate mind which is confident that it knows what is impossible. There was never a time when hearty dogmatism and loud confidence were more out of place. We must think as best we can, of course. The next step upward in the development of the human consciousness will not be achieved by either slovenly credulity or slovenly scepticism, but only by a terrifying mental travail.

I see a human mind as some multiple plant, here in full flower, there still in the bud. Different minds have flowered in different ways. Beethoven's *Heiliger Dankgesang eines Genesenen an die Gottheit* points to the complete development in him of something which those of us who understand him have only in embryo. In those who do not understand him it is non-existent. And the great mystics ought at least to make us doubt whether it is we who are not deficient rather than they who are mad. It is rash to dismiss our exceptional moods, our strange flashes of what seems like insight, as mere whimsies without significance. They

may be faint stirrings of the next thing that is destined to become fully alive. All that we can say is that the mind lives in a universe largely of its own creation, and that the universe, together with the mind, will change in ways we cannot foresee.

4

We have seen that the philosophy that regards man as a meaningless accident in an alien universe receives no support from modern physics. The true ground of that philosophy is now, as it always has been, the apparently

meaningless misery that forms part of life. It is not by mistaking matter for an ultimate reality or by pondering on the fact that laws of nature exist that we can conclude that man is of no cosmic significance. That conclusion can be reached logically only on the basis of arbitrary assumptions. But the conclusion is not, in fact, reached in that way: it is reached through feeling. And it cannot be transcended by a logical process, but only in virtue of a mystic experience.

The old materialistic outlook, although it no longer has any scientific justification, is still active in many branches of science. It has made

popular certain types of explanation and is the cause of the direction pursued by certain researches. In particular it has led to a great deal of useless or misleading work being done in the attempt to reduce qualitative to quantitative differences.

A good deal of what passes for scientific work amongst eugenists and psychologists consists of attempts to match things which are qualitatively different. This is the favourite procedure of that kind of psycho-analysis which reduces everything to sex. Discrimination is fatiguing ; also, it makes appeal to sensibilities which many earnest " scientific workers " do not

possess. It is much easier to make measurements than to know exactly what you are measuring.

To give up the ideal of measurability would be equivalent, to many people, to abandoning "science" altogether. "Science is measurement", we are informed. This ideal is borrowed from physics, the science whose aim it is to give mathematical descriptions of phenomena. But we may have branches of knowledge that may fairly be called science although they are not mathematical. We may find it necessary to use concepts that cannot be mathematically defined. It may not be mere lack of knowledge which prevents

biology, for instance, from being a mathematical science. It may be impossible in the nature of things ever to give the equation to a chicken. But the bias towards measureability is very strong and has led to measurements being made, particularly in psychology, where we really have no clear idea at all as to what is being measured. When, for instance, Professor Karl Pearson compares fraternal resemblances in such things as stature and arm-length with fraternal resemblances in intelligence and conscientiousness, what exactly is he doing? A great deal of what is called experimental psychology impresses one as

being nothing but the application of an inappropriate technique by exceptionally innocent and unworldly "scientists". The methods found so successful in physics are applied to everything under the sun. It is pretty obvious that this is not due to some mystic, Pythagorean conviction that number is the principle of all things, but merely to mental inertia. Many "intelligence tests" and many of the statistical results obtained by the eugenists impress the ordinary person as being laughably superficial. In their eagerness to "measure" something our researchers seem to lose their ordinary common sense, whereas their subject

really requires the subtlety and sympathy of a very good novelist. It is amazing the number of dull, unimaginative people who find a congenial life work in prosecuting researches in pseudo-science. The ordinary public, unfortunately, does not discriminate between one kind of science and another, with the result that the contempt they rightly feel for some so-called men of science is apt to be extended to all scientific men. Thus Mr G. K. Chesterton, having heard that some "scientists" explain the shape of a church spire as symbolical of phallic worship, begins to doubt the whole Royal Society. It must be

remembered that in science real insight and imagination are as rare as in any other human activity. In the clear-cut sciences, such as physics and chemistry, where the right way of attacking problems is known and where an elaborate technique has been built up, there is plenty of room for valuable routine work. All the difficult preliminary work of getting right conceptions and principles has been done. The routine worker can measure the electric capacities of different condensers because the difficult notion of electric capacity has been made clear by his masters. But the routine worker in psychology who measures "intelli-

gence" is not doing anything definite at all. His subject is not yet ripe for the application of such exact methods. In this way the prestige of physics has exerted a harmful influence on the study of psychology. It is true that some experimental psychologists are becoming aware of the fact that they do not always know what they are measuring. There are controversies as to what a given set of measurements has measured, and some measurements seem to be undertaken on the off-chance that a meaning will some day be found for them. It is not suggested that all experimental psychology is of this kind, but it is certainly true

that many psychological papers, complete with correlation coefficients and "curves" of all kinds, wear an air of precision to which they have no real claim.

A more definitely materialistic bias is observable in the attempts to explain psychological happenings in terms of physiology. The result is that learned and acute men, caught in the jungle of neurology, painfully fight their way out with some such epoch-making discovery as that one learns a subject more rapidly if one is interested in it. This result, which is supposed to be incompatible with the purely physiological theory of the mind, owes all

its difficulty to that incompatibility. Otherwise it is a perfectly obvious fact of experience. If it were not for the prestige achieved by materialism in the Victorian age it is probable that psychology would be very much further advanced than it is. But the side-tracking influence of that philosophy has meant that psychologists have had painfully to discover the obvious. But if materialism, in small doses, delays the recognition of the obvious, it does, when fully developed, deny the obvious. This is what the behaviourists do. They deny that we think or that we can form images in our minds. The only possible answer to this theory

is a satire, as when Voltaire answered the theory that in this world everything is for the best in the best of all possible worlds by writing *Candide*. But in this queer modern world behaviourism, instead of being greeted with laughter, is answered carefully and politely, apparently in the spirit in which Monsieur Bergeret shook hands with the *vers libriste* poet, " for fear of wronging beauty in disguise ". The position of the ordinary man in face of these theories is, nevertheless, a difficult one. Behaviourism may sound to him nonsense, but so does non-Euclidean geometry. His natural reaction would be to class both of them

with the theory that the English are descended from the lost ten tribes of Israel. Nevertheless, non-Euclidean geometry is not nonsense. In these circumstances it is probably fortunate that there are people patient enough to prepare careful and reasoned refutations of any whimsy that anybody cares to put forth. The extraordinary predisposition of the learned towards concocting merely silly theories must always be borne in mind. Studious persons often have a very small range of experience of life ; they have nothing like so broadly based a sense of probability as the ordinary man of the world possesses, which is why so many of

them seem curiously innocent and gullible. The beaming and genial professor expounding his theory often seems curiously like a child playing with toys. The mixture of amusement and respect with which the world watches him is, on the whole, the correct reaction. As long as he is dealing with the incomprehensible one may grant him authority. Nobody dreams of questioning astronomical pronouncements about forthcoming eclipses. But when he is talking about the very stuff of our ordinary experience, as in psychology, we do wrong to accept the obviously absurd for fear that it cannot be as silly as it looks. A great

deal of what is called psycho-analysis, for instance, is merely silly. Only people singularly deficient in common-sense and completely lacking in a sense of humour could have invented anything so preposterous. Undoubtedly some pathological states are of sexual origin, but the lengths to which the theory has been carried and the kind of interpretations that are given make the development of psycho-analysis one of the greatest psychological curiosities of our time. Whole-hearted belief in psycho-analysis certainly points to the existence of a complex. As with any other complex, it is defended by arguments to which none except

those who are similarly afflicted can attach the slightest validity. The complex is strongly materialistic, not in the sense that everything is reduced to "matter and motion", but in the sense that the lowest human activities are made explanatory of all the rest. One often finds, associated with a belief in materialism, a desire to deny any form of spiritual excellence. The ostensible motive is simplification, as when material substances are reduced to a small number of chemical elements; but it is usually obvious, from the forced explanations that are attempted, that the real motive is something very different. Much, of course, must be

attributed to insensitiveness, as we see when we turn to psycho-analytic explanations of works of art. The extraordinary force of the psycho-analysts' complex is well shown by the sort of arguments they find convincing. Thus they may profess to show that artistic tastes never exist without suppressed sexual desires. Their way of establishing this fact, which is chiefly by asserting it, is comparatively rational. But they then proceed to the statement that a taste for art is merely a disguised form of sexual desire. They might as well say that it is a disguised form of hunger, since artists are quite as notorious for being

hungry as for being erotic, and artistic tastes are never found to exist in a man who takes no nourishment.

Not only much modern psychology, but some other modern sciences such as comparative religion, are prone to a certain fallacy that may be called the fallacy of "explanation by origins". This kind of explanation has been made popular by the theory of evolution, and the fallacy consists in supposing that to give the historical antecedents of a thing is to give an analysis of that thing. Thus, some authorities suppose that by showing that religion has developed from primitive magic rites, they have thereby proved that

religion is nothing but a disguised form of magic. One might as well say that an oak-tree is a disguised form of an acorn, or that a man is a disguised form of an amoeba. But this error is too glaring to be committed by more than a small percentage of our modern "thinkers". A much more insidious danger is that this type of explanation leads one to under-estimate the complexity of the thing to be explained. There is a tendency to neglect those factors in the final product which cannot be traced in its historical antecedents. This is one form of the widespread error of undue simplification. No human mind can deal exhaustively with con-

crete facts. Every natural entity, whether it be a flower or a nation, contains far too many factors for thought to grasp it completely. The art of human thinking is to make useful abstractions. Any man is a very complicated creature. All the artists and scientists of the world could not describe him exhaustively. But for the purposes of war every man under a certain military rank was regarded as a physical structure supporting weapons and a stomach on two legs. This abstraction was useful for the purposes for which it was invented. A somewhat different abstraction is required when a man is considered

as a voter. When a man is considered as a "hand" or a "worker" it is found that slightly more complicated abstractions are required. In fact, the great fault of economic theory has been that its "economic man" was too simple an abstraction. The economist left out certain factors in his conception of man, with the result that his plans, when applied to real men, do not work. I am suggesting that the sciences which ape physics suffer, amongst other things, from inadequate abstractions. This is not surprising, for there is every reason to suppose that the extraordinary difficulties experienced by physics itself, at the present day, are due to the

same cause. An analysis of this position will show us the direction of the probable future development of science and help us to see in what consists the importance of the arts.

5

Many people, including some scientific men, take science too seriously. They think that science gives a far more comprehensive picture of reality than it really does. There have been philosophers who have gone so far as

to suppose that those factors of experience that science does not find it necessary to talk about do not really exist. This is the basis of the belief that colours, sounds, and scents have no "objective" existence; they exist only in the mind, whereas such qualities as mass and extension are supposed to exist independently of the mind. It is true that science does not find it necessary to refer to colours, sounds, and scents in giving its description of nature, whereas it does find it necessary to refer to mass and extension. But that does not prove that the former qualities are not as real as the latter, are not as indubitably

part of the universe. The scientific concepts have by no means proved themselves adequate to account for the whole of experience. Nearly everything of real importance to man lies at present outside science. The fact is that science was undertaken as an intellectual adventure: it was an attempt to find out how far nature could be described in mathematical terms. Certain primary conceptions —time, space, mass, force, and so on— all of which can be defined mathematically, were adopted, and it became a highly absorbing game to find out how much of what goes on around us could be described, mathematically, in terms

of these conceptions. The success of this effort has been so astonishing that some scientific men have forgotten to be astonished. They have come to take it for granted that a complete mathematical description of the world should be possible. This assumption is not a rational one: it is a pure act of faith. The great founders of the scheme made no such mistake: they were quite aware of the precarious nature of their enterprise. Thus, Newton, the greatest and most successful of them all, says that, if they find the mathematical method does not work, they must try a different method. The mathematical method, which

is the very essence of modern science, has, however, worked splendidly. From the time of its origination in the seventeenth century until the present day it has had no serious rival. The ancient aesthetic principle, which led to the conclusion that the planets moved in circles because the circle is the only perfect figure, is still used by theosophists, but not by men of science. Similarly the old moralistic principle, which explained the fact of water rising in a pump by saying that nature abhorred a vacuum, possibly lingers on only in such superstitions as that sunlight puts the fire out. In more modern times the only notorious rival

of the Newtonian method was the dialectic method of Hegel, who evolved the laws of the universe from his inner consciousness. But the best-known result of this method, that there could not be more planets than were known to exist, happened to be published on the very day that a new planet was discovered. The mathematical method, then, is at the present day without a rival. But, although we cannot at present imagine what could replace the mathematical method, we must be careful not to exaggerate the significance of the results that have been achieved by it. For these results depend not only on the method, but also on the

material the method has to work with. And there is good reason to suppose, in the present state of physics, that the material with which science has worked hitherto is turning out to be not quite satisfactory.

This material is chiefly the Newtonian set of abstractions. Newton postulated, as the fundamental constituents out of which the perceived universe is built up, Space, Time, and Matter. Space and time he regarded as absolute and as quite independent of matter. Matter was an enduring substance that simply inhabited space and time. The analysis of these conceptions has resulted in the Einstein theory, in which neither

space, time, nor matter are fundamental. The interesting thing about this analysis, from our present point of view, is that it shows clearly what arbitrary elements are present in the scientific description of the universe. For we must remember that moral and aesthetic elements were ruled out of the real universe simply because science did not find it necessary to mention them. The foundation stones of the scientific edifice, namely space, time, and matter, were supposed to be the only realities. Everything else was a sort of illusion. Men who must have been theory-mad soberly maintained that little particles of matter

wandering about purposelessly in space and time produced our minds, our hopes, and fears, the scent of the rose, the colours of the sunset, the songs of the birds, and our knowledge of the little particles themselves. The sole realities were the little wandering particles and the space and time they wandered in. The existence of everything else depended on the mind, and was inconceivable without the mind. It is interesting, therefore, that science has now reached a position where space, time, and matter also depend on the mind. In giving a scientific description of the universe Einstein does not find it necessary to begin with space, time,

and matter. These entities become "derivative". The universe becomes more spectral than ever if we are going to adopt the materialist principle that what depends on the mind does not really exist. Even the universe of wandering particles is comparatively cosy compared with this modern universe of undefinable "point-events". But if we do not adopt the materialist principle we may assert that moral and æsthetic values are as much a part of the real universe as anything else, and that the reason why science does not find it necessary to mention them is not because they are not there but because science is a game played

according to certain rules, and those rules have excluded these values from the outset. The life-insurance actuary may, for his purposes, neglect many things about men, and yet calculate, quite correctly, what percentage of them will die at forty. But he has not proved that the qualities he has neglected do not exist simply because they do not come in to upset his calculations. A politician finds that he has to base his calculations on quite different aspects of mankind from those found satisfactory by the actuary. In the same way, a mountain is a different thing to a poet from what it is to a man of science. For the kind

of understanding of the universe that the man of science is after, the mountain is merely a heap of certain kinds of matter weighing so many millions of tons. The poet, who is after a different kind of vision, finds it necessary to take into account quite other factors which enter into his total experience of the mountain. The scientist may also experience emotions of awe and reverence in the presence of the mountain, but for the purposes of his science these factors of his experience may be neglected. He *abstracts* from the total concrete fact of his experience of the mountain. The mountain, as he describes it in the scientific paper he

proceeds to write, is a mere pale shadow of the real mountain; he probably leaves it indistinguishable from any other mountain that happens to weigh the same, just as to the life-insurance actuary all men of forty are exactly alike. If we believe that the factors in experience that the scientific man neglects are quite as real as those he takes into account, it becomes a matter for wonder that science is possible. How is it that science forms a closed system—that nothing from the worlds it neglects ever comes in to disturb it?

It is one of the great services of relativity theory to philosophy that it

provides an answer to this question. The answer is that the entities discussed by physics are defined in terms of one another. The three hundred years of building up exact science really amounts, in the last analysis, to doing what the dictionary compiler did when he defined a violin as a small violoncello and a violoncello as a large violin. Of course, if this statement were literally true, science would give us no information about the universe at all. Nevertheless, the statement is true about the actual procedure of science, and it is in virtue of this procedure that science forms a closed system. But what is left out of this

description is the scientist himself. The mysterious process which is not taken into account in this description of the scientific method is the process by which the consciousness of the scientist makes contact with the entities he is talking about. In deducing the world from " point-events ", for instance, we begin by talking about something we have no direct cognisance of, namely point-events. From point-events we deduce " potentials "—again a mere word. But from potentials we deduce " matter ", and here we are talking of something of which we have direct knowledge. Similarly, the circular definition of violin and violoncello

tells us nothing as it stands. But to a man who can identify one of these entities, to a man who has ever seen a violin, it gives genuine information.

We need not be surprised, therefore, that nothing from the outside ever seems to disturb the equanimity that reigns within the closed system of physics. The abstractions with which it begins are all it ever has to deal with. There are no subsequent fresh contacts with reality. If the region covered by relativity theory embraced the whole of physics it would seem that, so far as physical science is concerned, we knew all that there is to be known. But it is notorious that, of recent years,

an entirely new set of phenomena has been discovered in physical science. These phenomena arise when we consider, not matter in bulk but matter in its smallest particles. These phenomena are, at present, strictly incomprehensible. The celebrated quantum theory provides us with rules for dealing with some of them, but does not make them intelligible. It seems that science has here reached its limits. Professor Eddington has even hinted that these phenomena may indicate that the universe is finally irrational, that is, that the attempt to describe nature mathematically will have to be given up. This is a possi-

bility that Newton foresaw. But it seems more likely that our present state of bewilderment has a different cause. That cause, we shall probably find, is the insufficiency of the abstractions hitherto used in science. We have to go back to the concrete facts of experience and build up a richer, fuller set of abstractions. Physics is now paying the penalty of inadequate abstraction. In particular, it must revise its notions of space, time, and substance. This revision is quite independent of the Einstein theory, and is made necessary, not by that theory but by the quantum theory. A first attempt at this revision has been made by

that great mathematical philosopher, Professor Whitehead.[1] We need not deal with his investigation, which is at present in a highly technical state. The space and time of the new theory are interconnected and do not consist of independent volumes and instants. Every volume of space has reference to the whole of space, and every moment of time refers both to the past and the future. Hence both memory and expectation are given a rational basis. On the old view, as Hume pointed out, there is no reason whatever to suppose that the order of nature should continue. Why do we expect that the force of gravity will be in

[1] *Science and the Modern World.*

existence to-morrow? There was no *reason* at all for this expectation or for any other. That is to say, the whole of science itself was based on blind faith. The new foundations of science make science itself a rational activity. As for the notion of "substance", Professor Whitehead proposes to replace it by the notion of "organism". We may imagine an electron, for instance, as a repeated pattern of events. One of the great difficulties of the quantum phenomena is that an electron seems to pass from one place to another without passing through the intervening space. On the basis of the new abstractions this difficulty can be overcome. We

have to imagine an electron as requiring a certain time to manifest itself—just as a tune does.

From our present point of view, however, the chief interest attaching to these new foundations for science is the place occupied in them by the intuitions of the poets. Mr Richards, literary critic, tells us that the poets must learn from science; Professor Whitehead, mathematician and physicist, tells us that science must learn from the poets. Instead of the poet having to realize that his intuitions are illusory and belong to a childish, *démodé* view of the world, it is the scientific man who must realize that his

abstractions are too thin and narrow to be any longer useful, and that the poet makes closer contact with reality. When Wordsworth says :

" Ye Presences of Nature in the sky
And on the earth ! Ye Visions of the hills !
And Souls of lonely places ! can I think
A vulgar hope was yours when ye employed
Such ministry, when ye through many a year
Haunting me thus among my boyish sports,
On caves and trees, upon the woods and hills,
Impressed upon all forms the characters
Of danger or desire ; and thus did make

The surface of the universal earth
With triumph and delight, with hope
and fear
Work like a sea ? . . .

he is not, according to Professor Whitehead, expressing fantasies that the strong-minded realist can afford to neglect : he is describing the actual concrete facts of experience, facts which, says Professor Whitehead, " are distorted in the scientific analysis ". It is the artist not the scientist who deals most adequately with reality. It is the man of science, taking his pale abstractions for the only realities, who dwells in dream-land.

So far as we can see at present,

however, science cannot abandon its method. It cannot deal with the whole concrete fact : it must continue to make abstractions. But the present *impasse* in scientific theory is an indication that it must go back to the beginning and include more factors of the concrete fact in its abstractions. It seems likely that, in doing so, it will have to presuppose a philosophy very different from the materialism hitherto current amongst scientific men. The world will have to be regarded as an evolutionary process, where "patterns of value" emerge. It will have to be regarded as an interconnected whole, and the separation of mind from matter, and

mind from mind, will have to be replaced by a conception which regards these distinctions, in their present form, as unreal. One very desirable result of this transformation will be that the arts will be taken seriously. The old outlook did not regard values as inherent in reality. They were merely expressive of the accidental human constitution, but had no cosmic significance. Art existed to provide a unique thrill, called the " æsthetic emotion ". On the new outlook the function of the arts is to communicate knowledge and, moreover, the most valuable kind of knowledge. Art, much more than science, expresses the concrete facts

of experience in their actuality. Music, in particular, finds its highest function in revealing to us the possibilities of the spirit of man himself. The music of such a man as Beethoven is a revelation of existence from the vantage point of a higher consciousness. It is, we may hope, prophetic of the future development of the race. Not only art, but morals, acquire vastly greater importance on the new outlook. Morals is no longer a purely private concern, expressive of a particular human constitution in an alien, strictly non-moral universe. Men are no longer justified in believing that their only duty is to preserve their self-respect

and to make the most of their opportunities.

Science, in view of our increased knowledge of its aims and powers, can no longer be presented to us as a tyrant. Science assumes certain fundamental principles and entities, and there is an arbitrary element in these assumptions. What science does not assume does not thereby not exist. It gives, and it appears that it must forever give, a *partial* description of the universe. The fact that the elements of reality it leaves out do not come in to disturb it is no presumption against the existence of these elements. For science forms a closed system simply

because it employs the device of cyclic definition. The teachings of science, so far as the spiritual problems of men are concerned, need no longer be regarded as stultifying: they are merely irrelevant.

TO-DAY AND TO-MORROW

Each, pott 8vo, boards, 2/6 net

THIS series of books, by some of the most distinguished English thinkers, scientists, philosophers, doctors, critics, and artists, was at once recognized as a noteworthy event. Written from various points of view, one book frequently opposing the argument of another, they provide the reader with a stimulating survey of the most modern thought in many departments of life. Several volumes are devoted to the future trend of Civilization, conceived as a whole; while others deal with particular provinces. It is interesting to see in these neat little volumes, issued at a low price, the revival of a form of literature, the Pamphlet, which has been in disuse for many years.

Published by
KEGAN PAUL, TRENCH, TRUBNER & CO., LTD.
Broadway House: 68-74 Carter Lane, London, E.C.4.

FROM THE REVIEWS

Times Literary Supplement: "An entertaining series."

Spectator: "Scintillating monographs."

Observer: "There seems no reason why the brilliant To-day and To-morrow Series should come to an end for a century of to-morrows. At first it seemed impossible for the publishers to keep up the sport through a dozen volumes, but the series already runs to more than two score. A remarkable series . . ."

Nation: "We are able to peer into the future by means of that brilliant series [which] will constitute a precious document upon the present time."—T. S. ELIOT.

Manchester Dispatch: "The more one reads of these pamphlets, the more avid becomes the appetite. We hope the list is endless."

Irish Statesman: "Full of lively controversy."

Daily Herald: "This series has given us many monographs of brilliance and discernment. . . . The stylistic excellences of this provocative series."

Field: "We have long desired to express the deep admiration felt by every thinking scholar and worker at the present day for this series. We must pay tribute to the high standard of thought and expression they maintain. As small gift-books, austerely yet prettily produced, they remain unequalled of their kind. We can give but the briefest suggestions of their value to the student, the politician, and the voter. . . ."

Japan Chronicle: "While cheap prophecy is a futile thing, wisdom consists largely in looking forward to consequences. It is this that makes these books of considerable interest."

New York World: "Holds the palm in the speculative and interpretative thought of the age."

TO-DAY AND TO-MORROW

VOLUMES READY

Daedalus, or Science and the Future. By J. B. S. HALDANE, Reader in Biochemistry, University of Cambridge. *Seventh impression.*

"A fascinating and daring little book."—*Westminster Gazette.* "The essay is brilliant, sparkling with wit and bristling with challenges."—*British Medical Journal.*

"Predicts the most startling changes."—*Morning Post.*

Callinicus, a Defence of Chemical Warfare. By J. B. S. HALDANE. *Second impression.*

"Mr. Haldane's brilliant study."—*Times Leading Article.* "A book to be read by every intelligent adult."—*Spectator.* "This brilliant little monograph."—*Daily News.*

Icarus, or the Future of Science. By BERTRAND RUSSELL, F.R.S. *Fourth impression.*

"Utter pessimism."—*Observer.* "Mr. Russell refuses to believe that the progress of Science must be a boon to mankind."—*Morning Post.* "A stimulating book, that leaves one not at all discouraged."—*Daily Herald.*

What I Believe. By BERTRAND RUSSELL, F.R.S. *Third impression.*

"One of the most brilliant and thought-stimulating little books I have read—a better book even than *Icarus.*"—*Nation.* "Simply and brilliantly written."—*Nature.* "In stabbing sentences he punctures the bubble of cruelty, envy, narrowness, and ill-will which those in authority call their morals."—*New Leader.*

Tantalus, or the Future of Man. By F. C. S. SCHILLER, D.Sc., Fellow of Corpus Christi College, Oxford. *Second impression.*

"They are all (*Daedalus*, *Icarus*, and *Tantalus*) brilliantly clever, and they supplement or correct one another."—*Dean Inge*, in *Morning Post.* "Immensely valuable and infinitely readable."—*Daily News.* "The book of the week."—*Spectator.*

Cassandra, or the Future of the British Empire. By F. C. S. SCHILLER, D.Sc.

"We commend it to the complacent of all parties."—*Saturday Review.* "The book is small, but very, very weighty; brilliantly written, it ought to be read by all shades of politicians and students of politics."—*Yorkshire Post.* "Yet another addition to that bright constellation of pamphlets."—*Spectator.*

Quo Vadimus? Glimpses of the Future. By E. E. FOURNIER D'ALBE, D.Sc., author of "Selenium, the Moon Element," etc.

"A wonderful vision of the future. A book that will be talked about."—*Daily Graphic.* "A remarkable contribution to a remarkable series."—*Manchester Dispatch.* "Interesting and singularly plausible."—*Daily Telegraph.*

Thrasymachus, the Future of Morals. By C. E. M. JOAD, author of "The Babbitt Warren," etc. *Second impression.*

"His provocative book."—*Graphic.* "Written in a style of deliberate brilliance."—*Times Literary Supplement.* "As outspoken and unequivocal a contribution as could well be imagined. Even those readers who dissent will be forced to recognize the admirable clarity with which he states his case. A book that will startle."—*Daily Chronicle.*

Lysistrata, or Woman's Future and Future Woman. By ANTHONY M. LUDOVICI, author of "A Defence of Aristocracy," etc. *Second Impression.*

"A stimulating book. Volumes would be needed to deal, in the fullness his work provokes, with all the problems raised."—*Sunday Times.* "Pro-feminine, but anti-feministic." *Scotsman.* "Full of brilliant common-sense." —*Observer.*

Hypatia, or Woman and Knowledge. By MRS BERTRAND RUSSELL. With a frontispiece. *Third impression.*

An answer to *Lysistrata.* "A passionate vindication of the rights of women."—*Manchester Guardian.* "Says a number of things that sensible women have been wanting publicly said for a long time."—*Daily Herald.*

Hephaestus, the Soul of the Machine. By E. E. FOURNIER D'ALBE, D.Sc.

"A worthy contribution to this interesting series. A delightful and thought-provoking essay."—*Birmingham Post.* "There is a special pleasure in meeting with a book like *Hephaestus.* The author has the merit of really understanding what he is talking about." —*Engineering.* "An exceedingly clever defence of machinery."—*Architects' Journal.*

The Passing of the Phantoms : a Study of Evolutionary Psychology and Morals. By C. J. PATTEN, Professor of Anatomy, Sheffield University. With 4 Plates.

"Readers of *Daedalus, Icarus* and *Tantalus,* will be grateful for an excellent presentation of yet another point of view."—*Yorkshire Post.* "This bright and bracing little book." *Literary Guide.* "Interesting and original." —*Medical Times.*

The Mongol in our Midst: a Study of Man and his Three Faces. By F. G. CROOKSHANK, M.D., F.R.C.P. With 28 Plates. *Second Edition, revised.*

"A brilliant piece of speculative induction."—*Saturday Review.* "An extremely interesting and suggestive book, which will reward careful reading."—*Sunday Times.* "The pictures carry fearful conviction."—*Daily Herald.*

The Conquest of Cancer. By H. W. S. WRIGHT, M.S., F.R.C.S. Introduction by F. G. CROOKSHANK, M.D.

"Eminently suitable for general reading. The problem is fairly and lucidly presented. One merit of Mr Wright's plan is that he tells people what, in his judgment, they can best do, *here and now.*"—From the *Introduction.*

Pygmalion, or the Doctor of the Future. By R. MCNAIR WILSON, M.B.

"Dr Wilson has added a brilliant essay to this series."—*Times Literary Supplement.* "This is a very little book, but there is much wisdom in it."—*Evening Standard.* "No doctor worth his salt would venture to say that Dr Wilson was wrong."—*Daily Herald.*

Prometheus, or Biology and the Advancement of Man. By H. S. JENNINGS, Professor of Zoology, Johns Hopkins University.

"This volume is one of the most remarkable that has yet appeared in this series. Certainly the information it contains will be new to most educated laymen. It is essentially a discussion of . . . heredity and environment, and it clearly establishes the fact that the current use of these terms has no scientific justification."—*Times Literary Supplement.* "An exceedingly brilliant book."—*New Leader.*

Narcissus: an Anatomy of Clothes. By GERALD HEARD. With 19 illustrations.

"A most suggestive book."—*Nation* "Irresistible. Reading it is like a switchback journey. Starting from prehistoric times we rocket down the ages."—*Daily News*. "Interesting, provocative, and entertaining."—*Queen*.

Thamyris, or Is There a Future for Poetry? By R. C. TREVELYAN.

"Learned, sensible, and very well-written."—*Affable Hawk*, in *New Statesman*. "Very suggestive."—*J. C. Squire*, in *Observer*. "A very charming piece of work, I agree with all, or at any rate, almost all its conclusions."—*J. St. Loe Strachey*, in *Spectator*.

Proteus, or the Future of Intelligence. By VERNON LEE, author of "Satan the Waster," etc.

"We should like to follow the author's suggestions as to the effect of intelligence on the future of Ethics, Aesthetics, and Manners. Her book is profoundly stimulating and should be read by everyone."—*Outlook*. "A concise, suggestive piece of work."—*Saturday Review*.

Timotheus, the Future of the Theatre. By BONAMY DOBRÉE, author of "Restoration Drama," etc.

"A witty, mischievous little book, to be read with delight."—*Times Literary Supplement*. "This is a delightfully witty book."—*Scotsman*. "In a subtly satirical vein he visualizes various kinds of theatres in 200 years time. His gay little book makes delightful reading."—*Nation*.

Paris, or the Future of War. By Captain B. H. LIDDELL HART.

"A companion volume to *Callinicus*. A gem of close thinking and deduction." —*Observer*. "A noteworthy contribution to a problem of concern to every citizen in this country."—*Daily Chronicle*. "There is some lively thinking about the future of war in *Paris*, just added to this set of live-wire pamphlets on big subjects."—*Manchester Guardian*.

Wireless Possibilities. By Professor A. M. Low. With 4 diagrams.

"As might be expected from an inventor who is always so fresh, he has many interesting things to say."—*Evening Standard*. "The mantle of Blake has fallen upon the physicists. To them we look for visions, and we find them in this book."—*New Statesman*.

Perseus: of Dragons. By H. F. SCOTT STOKES. With 2 illustrations.

"A diverting little book, chock-full of ideas. Mr Stokes' dragon-lore is both quaint and various."—*Morning Post*. "Very amusingly written, and a mine of curious knowledge for which the discerning reader will find many uses."—*Glasgow Herald*.

Lycurgus, or the Future of Law. By E. S. P. HAYNES, author of "Concerning Solicitors," etc.

"An interesting and concisely written book." —*Yorkshire Post*. "He roundly declares that English criminal law is a blend of barbaric violence, medieval prejudices, and modern fallacies. . . . A humane and conscientious investigation."—*T.P.'s Weekly*. "A thoughtful book—deserves careful reading."—*Law Times*.

Euterpe, or the Future of Art. By LIONEL R. MCCOLVIN, author of "The Theory of Book-Selection."

"Discusses briefly, but very suggestively, the problem of the future of art in relation to the public."—*Saturday Review.* "Another indictment of machinery as a soul-destroyer . . . Mr Colvin has the courage to suggest solutions."—*Westminster Gazette.* "This is altogether a much-needed book."—*New Leader.*

Pegasus, or Problems of Transport. By Colonel J. F. C. FULLER, author of "The Reformation of War," etc. With 8 Plates.

"The foremost military prophet of the day propounds a solution for industrial and unemployment problems. It is a bold essay . . . and calls for the attention of all concerned with imperial problems."—*Daily Telegraph.* "Practical, timely, very interesting and very important."—J. St. Loe Strachey, in *Spectator.*

Atlantis, or America and the Future. By Colonel J. F. C. FULLER.

"Candid and caustic."—*Observer.* "Many hard things have been said about America, but few quite so bitter and caustic as these."—*Daily Sketch.* "He can conjure up possibilities of a new Atlantis."—*Clarion.*

Midas, or the United States and the Future. By C. H. BRETHERTON, author of "The Real Ireland", etc.

A companion volume to *Atlantis.* "Full of astute observations and acute reflections . . . this wise and witty pamphlet, a provocation to the thought that is creative."—*Morning Post.* "A punch in every paragraph. One could hardly ask for more 'meat.'"—*Spectator.*

Nuntius, or Advertising and its Future. By GILBERT RUSSELL.

"Expresses the philosophy of advertising concisely and well."—*Observer*. "It is doubtful if a more straightforward exposition of the part advertising plays in our public and private life has been written."—*Manchester Guardian*.

Birth Control and the State: a Plea and a Forecast. By C. P. BLACKER, *M.C.*, M.A., M.R.C.S., L.R.C.P.

"A very careful summary."—*Times Literary Supplement*. "A temperate and scholarly survey of the arguments for and against the encouragement of the practice of birth control."—*Lancet*. "He writes lucidly, moderately, and from wide knowledge; his book undoubtedly gives a better understanding of the subject than any other brief account we know. It also suggests a policy."—*Saturday Review*.

Ouroboros, or the Mechanical Extension of Mankind. By GARET GARRETT.

"This brilliant and provoking little book."—*Observer*. "A significant and thoughtful essay, calculated in parts to make our flesh creep."—*Spectator*. "A brilliant writer, Mr. Garrett is a remarkable man. He explains something of the enormous change the machine has made in life."—*Daily Express*.

Artifex, or the Future of Craftsmanship. By JOHN GLOAG, author of "Time, Taste, and Furniture."

"An able and interesting summary of the history of craftsmanship in the past, a direct criticism of the present, and at the end his hopes for the future. Mr Gloag's real contribution to the future of craftsmanship is his discussion of the uses of machinery."—*Times Literary Supplement*.

Plato's American Republic. By J. DOUGLAS WOODRUFF. *Third impression.*

"Uses the form of the Socratic dialogue with devastating success. A gently malicious wit sparkles in every page."—*Sunday Times.* "Having deliberately set himself an almost impossible task, has succeeded beyond belief."—*Saturday Review.* "Quite the liveliest even of this spirited series."—*Observer.*

Orpheus, or the Music of the Future. By W. J. TURNER, author of "Music and Life."

"A book on music that we can read not merely once, but twice or thrice. Mr Turner has given us some of the finest thinking upon Beethoven that I have ever met with."—*Ernest Newman* in *Sunday Times.* "A brilliant essay in contemporary philosophy."—*Outlook.* "The fruit of real knowledge and understanding."—*New Statesman.*

Terpander, or Music and the Future. By E. J. DENT, author of "Mozart's Operas."

"In *Orpheus* Mr Turner made a brilliant voyage in search of first principles. Mr Dent's book is a skilful review of the development of music. It is the most succinct and stimulating essay on music I have found. . . ."—*Musical News.* "Remarkably able and stimulating."—*Times Literary Supplement.* "There is hardly another critic alive who could sum up contemporary tendencies so neatly."—*Spectator.*

Sibylla, or the Revival of Prophecy. By C. A. MACE, University of St. Andrew's.

"An entertaining and instructive pamphlet."—*Morning Post.* "Places a nightmare before us very ably and wittily."—*Spectator.* "Passages in it are excellent satire, but on the whole Mr Mace's speculations may be taken as a trustworthy guide . . . to modern scientific thought."—*Birmingham Post.*

Lucullus, or the Food of the Future. By OLGA HARTLEY and MRS C. F. LEYEL, authors of 'The Gentle Art of Cookery.'

"This is a clever and witty little volume in an entertaining series, and it makes enchanting reading."—*Times Literary Supplement.* "Opens with a brilliant picture of modern man, living in a vacuum-cleaned, steam-heated, credit-furnished suburban mansion 'with a wolf in the basement'—the wolf of hunger. This banquet of epigrams."—*Spectator.*

Procrustes, or the Future of English Education. By M. ALDERTON PINK.

"Undoubtedly he makes out a very good case."—*Daily Herald.* "This interesting addition to the series."—*Times Educational Supplement.* "Intends to be challenging and succeeds in being so. All fit readers will find it stimulating."—*Northern Echo.*

The Future of Futurism. By JOHN RODKER.

"Mr. Rodker is up-to-the-minute, and he has accomplished a considerable feat in writing, on such a vague subject, 92 extremely interesting pages." — T. S. Eliot, in *Nation.* "There are a good many things in this book which are of interest." — *Times Literary Supplement.*

Pomona, or the Future of English. By BASIL DE SÉLINCOURT, author of 'The English Secret', etc.

"The future of English is discussed fully and with fascinating interest."—*Morning Post.* "Has a refreshing air of the unexpected. Full of wise thoughts and happy words."—*Times Literary Supplement.* "Here is suggestive thought, quite different from most speculations on the destiny of our language."—*Journal of Education.*

Balbus, or the Future of Architecture. By CHRISTIAN BARMAN, editor of 'The Architect's Journal'.

"A really brilliant addition to this already distinguished series. The reading of *Balbus* will give much data for intelligent prophecy, and incidentally, an hour or so of excellent entertainment."—*Spectator.* "Most readable and reasonable. We can recommend it warmly."—*New Statesman.* "This intriguing little book."—*Connoisseur.*

JUST PUBLISHED

Apella, or the Future of the Jews. By A QUARTERLY REVIEWER.

"Cogent, because of brevity and a magnificent prose style, this book wins our quiet praise. It is a fine pamphlet, adding to the value of the series, and should not be missed."—*Spectator.* "A notable addition to this excellent series. His arguments are a provocation to fruitful thinking."—*Morning Post.*

The Dance of Çiva, or Life's Unity and Rhythm. By COLLUM.

"It has substance and thought in it. The author is very much alive and responsive to the movements of to-day which seek to unite the best thought of East and West, and discusses Mussolini and Jagadis Bose with perspicacity."—*Spectator.*

Lars Porsena, or the Future of Swearing and Improper Language. By ROBERT GRAVES.

"An amusing little book."—*Daily Mirror.* "It is to this subject [of swearing] that Mr. Graves brings much erudition and not a little irony."—*John O'London's Weekly.* "Not for squeamish readers."—*Spectator.* "Too outspoken. The writer sails very near the wind, but all the same has some sound constructive things to say."—*Manchester Dispatch.*

Socrates, or the Emancipation of Mankind. By H. F. CARLILL.

Sets out the new view of the nature of man, to which the trend of modern psychology, anthropology, and evolutionary theory has led, shows the important consequences to human behaviour and efficiency which are bound to follow, and maintains that man is at last conscious of his power to control his biological inheritance.

Delphos, or the Future of International Language. By E. SYLVIA PANKHURST.

An inquiry into the possibility of a medium of inter-communication, auxiliary to the mother tongues. A survey of past attempts from the sixteenth century to the present day. A prophecy of the coming inter-language, its form, its social and cultural utility, and its influence on world peace.

Gallio, or the Tyranny of Science. By J. W. N. SULLIVAN, author of "A History of Mathematics."

Is the scientific universe the real universe? What is the character of the universe revealed by modern science? Are values inherent in reality? What is the function of the arts? In addition to answering these questions, the author attacks the notion that science is materialistic.

Apollonius, or the Future of Psychical Research. By E. N. BENNETT, author of "Problems of Village Life," etc.

An attempt to summarize the results secured by the scientific treatment of psychical phenomena, to forecast the future developments of such research, and to answer the familiar question "What is the good of it all?"

NEARLY READY

Janus, or the Conquest of War. By WILLIAM MCDOUGALL, M.B., F.R.S., Professor of Psychology, Harvard University, author of "The Group Mind," etc.

A volume of fundamental importance to all those who would avoid future wars. Sections are devoted to lessons of the Great War, the Causes of War, Preventives of War, League to Enforce Peace, and International Air Force as a Prevention of War.

Rusticus, or the Future of the Countryside. By MARTIN S. BRIGGS, F.R.I.B.A., author of "A Short History of the Building Crafts," etc.

Attributes much of the blame for the desecration of our countryside to the petrol engine, though he recognizes other contributory causes. He attempts to analyse the charm of our counties before the Industrial Revolution and shows how that movement influenced their aspect. Finally he surveys the future, making practical suggestions to avoid further 'uglification.'

Aeolus, or the Future of the Flying Machine. By OLIVER STEWART, author of "Strategy and Tactics of Air Fighting."

A picture of the air-vehicle and air-battleship of the future, painted with colours from the aeronautical research work of to-day. The author foresees that the flying machine will resist mass production. Aircraft will be exalted as individual creations of the Artist-Scientist rather than debased as tools of the Commercialist.

Stentor, or the Future of the Press. By DAVID OCKHAM.

Shows how since the War the control of the Press has passed into the hands of only five men. The law is powerless, even if willing, to check this justification. Now that independent organs of opinion are almost eliminated, the author discusses the danger to the community unless the Public is made aware of the personalities and policies behind the Trusts.

IN PREPARATION

The Future of India. By T. EARLE WELBY.

An analysis of the spiritual and political future of 320 million persons in the light of present tendencies.

Mercurius, or the World on Wings. By C. THOMPSON WALKER.

A picture of the air-vehicle and the air-port of to-morrow, and the influence aircraft will have on our lives.

The Future of Films. By ERNEST BETTS.

Vulcan, or Labour To-Day and To-Morrow. By CECIL CHISHOLM.

Date Due

MAR 1 5 1974			

CAT. NO. 23 233 PRINTED IN U.S.A.